

**CLAIMS:**

- 1 A washing appliance, which in use is connected to a water supply, said appliance including a wash chamber, a water softener and a programmed controller, said water softener comprising:
- 5 a resin container which contains a resin suitable for softening water which receives water from said water supply and supplies water to said wash chamber;
- a brine container having an inlet for the supply of salt, an inlet for the supply of water and an outlet;
- 10 a pump controlled by said programmed controller which receives brine from said outlet of said brine container and pumps brine through said resin container to thereby regenerate said resins in accordance, with a duty cycle selected in accordance with the supply water hardness.
2. A washing appliance as claimed in claim 1 including a flow directing valve
- 15 connected to said water supply having one outlet feeding said resin container, and the second outlet feeding said wash chamber, said flow directing valve being controlled by said controller to provide a flow to one or both of said outlets so as to provide a blend of supply water and softened water to said wash chamber.
- 20 3. A washing appliance as claimed in claim 2 wherein said controller controls said flow directing valve so as to determine the ratio of the water components of said blend to achieve a desired softness of water in said wash chamber.
4. A washing appliance as claimed in either of claim 2 or claim 3 wherein said
- 25 flow directing valve is a two-way solenoid.
- 5 A washing appliance as claimed any one of claims 1 to 4 including a detergent dispenser wherein water supplied to said wash chamber by said water softener passes through said detergent dispenser.
- 30 6 A washing appliance as claimed in any one of claims 1 to 5 wherein said water softener is mounted in a hollow wall of said washing appliance.

7 A washing appliance as claimed in any one of claims 1 to 6 wherein said brine container additionally has an overflow weir for the maintenance of a maximum water level in said brine container.

5 8 A washing appliance as claimed in claim 7 wherein said overflow weir spillage is coupled directly to an appliance drain.

9 A washing appliance as claimed in claim 7 wherein said overflow weir spillage is coupled directly to an appliance sump.

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10 A washing appliance as claimed any one of claims 1 to 9 wherein said water level in said brine container is controlled by a float valve.

11 A washing appliance as claimed in any one of claims 1 to 10 wherein said  
15 water softener has a user indicator to indicate the absence of salt.

12 A washing appliance as claimed in claim 11 wherein said indicator comprises a light and a light pipe.

20 13 A washing appliance as claimed in claim 12 wherein said light pipe extends between said brine container and a point of visibility said light is located in the bottom of said brine container in alignment with the bottom of said light pipe, wherein rays from said light pass through said light pipe when solid salt is absent from the space between the light and the end of the light pipe.

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14 A washing appliance as claimed in claim 11 wherein said indicator comprises an indicator light energised when the absence of solid salt has been detected using a light and light sensor located in said brine container.

30 15 A washing appliance as claimed in claim 14 wherein energising of said indicator light is controlled by said programmed controller.

16 A washing appliance as claimed in claim 11 wherein said light source and

said light sensor are located in a spaced apart relationship at the bottom of said brine container, to define an optical path there between, a controller receiving as an input the output signal of said light sensor and said indicator light being energised by said controller upon receiving a signal from said light sensor when the optical  
5 path between said light source and said light sensor is substantially transmissive.

17 A washing appliance as claimed in either claim 15 or claim 16 wherein said controller can delay energising said indicator light for a delay period after absence of solid salt is detected.

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18 A washing appliance as claimed in any one of claims 1 to 17 wherein said appliance in use is accommodated within a cavity in kitchen joinery or a free-standing cabinet, and additionally comprises:

a wash system slidably mounted within said cavity in a manner that it may be  
15 withdrawn horizontally for access thereto, said wash system including:

an open top chamber adapted to accommodate items to be washed and  
within which water is circulated;

means for evacuating wash liquid from said chamber; and

a wash chamber closure that covers the open top of said open top  
20 chamber on retraction of wash chamber into said cavity.

19 A washing appliance as claimed in any one of claims 1 to 18 wherein said washing appliance is a dishwasher.

25 20 A water softener comprising:

a resin container which contains a resin suitable for softening water which receives water from a water supply;

a brine container having an inlet for the supply of salt, an inlet for the supply of water and an outlet;

30 a pump controlled by a programmed controller which receives brine from said outlet of said brine container and pumps brine through said resin container to thereby regenerate said resins in accordance with a duty cycle selected in accordance with the supply water hardness; and

an outlet for the supply of softened water.

21. A water softener as claimed in claim 20 including a flow directing valve connected to said water supply having one outlet feeding said resin container, and  
5 the second outlet feeding said outlet for the supply of softened water, said flow directing valve being controlled by said controller to provide a flow to one or both of said outlets so as to provide a blend of supply water and softened water.

22. A water softener as claimed in claim 21 wherein said controller controls said  
10 flow directing valve so as to determine the ratio of the water components of said blend to achieve a desired softness of water.

23. A water softener as claimed in either of claim 21 or claim 21 wherein said  
15 flow directing valve is a two-way solenoid.

24 A water softener as claimed in any one of claims 20 to 23 wherein said brine container additionally has an overflow weir for the maintenance of a maximum water level in said brine container.

20 25 A water softener as claimed in any one of claims 20 to 24 wherein said supply of water to said brine container is controlled by a float valve.

26 A water softener as claimed in any one of claims 20 to 25 wherein said water softener container has an indicator to indicate the absence of salt.

25 27 A water softener as claimed in claim 26 wherein said indicator comprises a light and a light pipe.

28 A water softener as claimed in claim 27 wherein said light pipe extends  
30 between said brine container and a point of visibility said light is located in the bottom of said brine container in alignment with the bottom of said light pipe, wherein rays from said light pass through said light pipe when solid salt is absent from the space between the light and the end of the light pipe.

29 A water softener as claimed in claim 26 wherein said indicator comprises an indicator light energised when the absence of solid salt has been detected using a light and light sensor located in said brine container.

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30 A water softener as claimed in claim 29 wherein energising of said indicator light is controlled by said programmed controller.

31 A water softener as claimed in claim 29 wherein said light source and said  
10 light sensor are located in a spaced apart relationship at the bottom of said brine container, to define an optical path there between, a controller receiving as an input the output signal of said light sensor and said indicator light being energised by said controller upon receiving a signal from said light sensor when the optical path between said light source and said light sensor is substantially transmissive.

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32 A water softener as claimed in either claim 30 or claim 31 wherein said controller can delay energising said indicator light for a delay period after absence of solid salt is detected.

20 33 A washing appliance which in use is accommodated within a cavity in kitchen joinery or in a free-standing cabinet, said appliance comprising:

a wash system slidably mounted within said cavity in a manner that it may be withdrawn horizontally for access thereto, said wash system including:

25 an open top chamber adapted to accommodate items to be washed and within which water is circulated;

means to supply water to said open top chamber including water softener means associated with said open top chamber;

means for evacuating wash liquid from said chamber; and

30 a wash chamber closure that covers the open top of said open top chamber on retraction of wash chamber into said cavity.

34 A washing appliance as claimed in claim 33 including a detergent dispenser wherein water supplied to said wash chamber by said water softener passes through

said detergent dispenser.

35 A washing appliance as claimed in either of claim 33 or claim 34 wherein said water softener means are mounted in a hollow wall of said washing appliance.

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36 A washing appliance as claimed in any one of claims 33 to 35 wherein said washing appliance is a dishwasher.

37 A salt absence indicator for a brine container of a water softener, said salt  
10 absence indicator comprising:

a light source and light sensor located in a spaced apart relationship at the bottom of said brine container, to define an optical path there between, a controller receiving as an input the output signal of said light sensor, and

15 an indicator light said indicator light being energised by said controller upon receiving a signal from said light sensor when the optical path between the light source and light sensor is substantially transmissive.

38 A salt absence indicator as claimed in claim 37 wherein said controller includes means for delaying energising said indicator light for period after receiving  
20 said signal from said light sensor corresponding to said optical path being transmissive.

39 A salt absence detection indicator for a brine container of a water softener, said indicator comprising:

25 a light pipe extending between said brine container and a point of visibility; and

a light located in the bottom of said brine container in alignment with the bottom of said light pipe,

30 wherein rays from said light pass through said light pipe when salt is absent from the space between the light and the end of the light pipe.

40. A washing appliance as hereinbefore described in any of the embodiments with reference to any of the drawings.

- 41 A water softener as hereinbefore described in any of the embodiments with reference to any of the drawings.
- 5 42 A salt absence detection indicator for a brine container of a water softener as hereinbefore described in any of the embodiments with reference to any of the drawings.